farm machinery costs
as a guide to custom rates
1990

PREFACE

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Since 1975, Alberta Agriculture has annually undertaken to provide information on the cost of owning and operating farm machinery.

This publication provides technical information on current machinery prices, repair rates, performance capacity, fuel consumption and price. The information is organized into fixed and variable costs to provide a basis for budgeting machinery costs. The cost calculations are intended to be used as approximate cost figures. It is recommended that adjustments be made as desired to suite individual situations. In addition the 1989 custom rates have been included for comparison.

We gratefully acknowledge the services of Cal Ausenhus who again conducted the machinery cost survey. Cheri Humphries and Gerd Andres from the Farm Business Management Branch of Alberta Agriculture also contributed to updating this publication. The Market Rate Survey data was provided from a joint-project with Statistics Branch.

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INTRODUCTION

This publication outlines steps in the identification of costs incurred by some of the machinery units used in field and livestock operations.

HOW TO USE THE GUIDE

1. If you are a full-time custom operator, then use the Total Machine Cost + Labor + Profit for estimating a charge. Be sure to adjust fixed costs if your annual hours of use differ much from those quoted. The profit margin can be adjusted to meet the market conditions.

2. If you are doing custom work on a good neighbor payment basis, then fixed costs of owning the machine may be ignored since they represent an annual cost incurred whether or not custom work is done. However, the rate should cover all variable costs which include an allowance for repairs. Labor and profit margin can be adjusted to meet each situation.

3. If you plan to do custom work in addition to your own work, so as to partly justify ownership of a larger machine, then the custom charge should cover variable costs, labor, a profit margin plus a proportion of fixed costs calculated as follows:

$$\text{Proportion of Fixed Costs} = \frac{\text{Hours of Custom Work}}{\text{Total Annual Hours of Use}} \times \text{Total Fixed Costs}$$

4. If you are renting out machinery, then you will wish to at least cover fixed costs and those variable costs such as lubrication and repairs which may not be already covered by the renter.

5. If you wish to assess a rate for a full operation such as silage making, which requires several machines, then add the hourly costs of each activity, making sure that there is neither omission nor duplication. Use worksheets on pages 14 to 19.

6. The purchase cost estimates are based on average cash prices as of February, 1990 for each class of machine. These represent current replacement costs which should be budgeted and charged for, even if you do custom work with older machines, unless the older machine will not do a comparable job.

KEY ASSUMTPIONS

1. Estimated years of life, annual hours of use and annual repair rates are specified for each type of machine.

2. Diesel fuel is charged at $.17 per litre, purple gas at $.29 per litre and propane at $.18 per litre.

3. Return on investment is calculated using a Bank of Canada prime rate of 14% with an additional allowance for risk of 6%. Inflation was included at a 5% rate. Calculations follow the procedures on pages 13 to 18.

4. Income tax considerations have not been included in the calculations.

OTHER CONSIDERATIONS

1. Favorable or unfavorable working conditions such as size of job, distance, access, topography, soil type and possible down time, may modify the guide figures. Per hour charges allow for some of these situations.

2. Charges per unit of output such as per acre, per bushel or per bale, defined on work rates per hour, may be quite different from those quoted. Per hour charging overcomes some of these uncertainties.

3. You can adjust the labor charge according to your actual cost of hired work or the opportunity cost of your own labor.

4. If your experience and farm records suggest that other costs and assumptions would suit your situation, then recalculate using the worksheets on pages 14 to 19.

5. Earlier and faster may be cheaper. There are costs attached to late completion of operations. The rewards for timely quality work, quickly completed by large machines, is only earned if the support system, including seed and fertilizer supplies, and grain trucking, is well organized.

OTHER INFORMATION SOURCES

Custom Rates Survey Summary - 1990, Alberta Agriculture, Agdex 825-9, February 1990
Know Your Farm Machinery Costs, Alberta Agriculture, Agdex 825-6, March 1989
Leasing vs. Buying Farm Machinery, Alberta Agriculture, Agdex 825-19, May 1985
Replacing Farm Machinery, Alberta Agriculture, Agdex 825-18, July 1983
What is A Fair Charge For Custom Work?, Alberta Agriculture, Agdex 825-15, July 1983

TRACTOR - 2WD

Years Live = 13
Annual Use = 200, 400*, 600
Annual Repair Rate = 3% of Replacement Cost

	Annual Hours Used	Diesel Use Litres/Hr	Current Replace Cost $	Fixed Cost $/Hr	Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Labor $/Hr	Profit $/Hr	Market Rate Survey 1989
40 HP	200	8	20000	18.04	3.06	21.10			0.22 per HP/HR
	400			9.02		12.08			
	600			6.01		9.08			
60 HP	200	13	24000	21.64	4.34	25.99			
	400			10.82		15.16			
	600			7.21		11.56			
80 HP	200	17	40000	36.07	6.32	42.40			0.19 per HP/HR
	400			18.04		24.36			
	600			12.02		18.35			
100 HP	200	22	56000	50.50	8.50	59.00			
	400			25.25		33.75			
	600			16.83		25.34			
120 HP	200	28	62000	55.91	10.12	66.04			
	400			27.96		38.08			
	600			18.64		28.76			
140 HP	200	32	70000	63.13	11.51	74.63			
	400			31.56		43.07			
	600			21.04		32.55			
160 HP	200	38	79000	71.24	13.35	84.60			
	400			35.62		48.98			
	600			23.75		37.10			
180 HP	200	39	88000	79.36	14.22	93.58			
	400			39.68		53.90			
	600			26.45		40.68			

Front wheel assist option at $9,000 - $13,000 adds $4.06 - $5.86 per hour to total machine cost.

* This Annual Hours Use figure is typical.

TRACTOR = 4WD

Years Life = 13
Annual Use = 200, 400*, 600
Annual Repair Rate = 3% of Replacement Cost

	Annual Hours Used	Diesel Use litres/Hr	Current Replace Cost $	Fixed Cost $/Hr	Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Labor $/Hr	Profit $/Hr	Market Rate Survey 1989
175 HP	200	34	88000	79.36	13.25	92.61			0.19 per HP/HR
	400			39.68		52.93			
	600			26.45		39.70			
220 HP	200	40	101000	91.08	15.40	106.48			
	400			45.54		60.94			
	600			30.36		45.76			
250 HP	200	50	108000	97.40	17.88	115.27			
	400			48.70		66.57			
	600			32.47		50.34			
275 HP	200	53	115000	103.71	18.99	122.70			
	400			51.85		70.84			
	600			34.57		53.56			
300 HP	200	58	125000	112.73	20.71	133.44			
	400			56.36		77.08			
	600			37.58		58.29			
350 HP **	200	62	140000	126.26	22.62	148.88			
	400			63.13		85.75			
	600			42.09		64.71			
450 HP **	200	85	185000	166.84	30.49	197.33			
	400			83.42		113.91			
	600			55.61		86.10			

* This Annual Hours Use figure is typical.

** Priced without PTO.

CULTIVATION EQUIPMENT

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	TOTAL Machine Cost Acre/Hr	TOTAL Machine Cost $/Acre	Labor $/	Profit $/	Market Rate Survey 1989
PLOWS	Life = 15		Annual Hours Use = 150		Annual Repair Rate = 6%	Replace Cost						
3 X 16" 3 Point	60	5500	10.82	4.34	6.34	2.20	23.70	2.0	11.85			10.00 - 24.00 per acre
5 x 16" Semi 3 pt	120	10000	27.96	10.12	11.53	4.00	53.61	3.0	17.87			
6 x 18" Trailing	140	15000	31.56	11.51	17.29	6.00	66.36	4.0	16.59			
8 x 16" Trailing	220	17000	45.54	15.40	19.60	6.80	87.33	6.0	14.56			
10 x 18" Trailing	250	20000	48.70	17.88	23.05	8.00	97.63	7.0	13.95			
HD CULTIVATORS	Life = 15		Annual Hours Use = 250		Annual Repair Rate = 6%	Replace Cost						
14' Single	80	9500	18.04	6.32	6.57	2.28	33.21	7.0	4.74			3.25 - 6.00 per acre
22' Wing	120	15000	27.96	10.12	10.37	3.60	52.06	11.0	4.73			
31' Wing	160	22000	35.62	13.35	15.22	5.28	69.47	15.0	4.63			
42' Wing	220	26000	45.54	15.40	17.98	6.24	85.16	20.0	4.26			
60' Wing	350	36000	63.13	22.62	24.90	8.64	119.29	30.0	3.98			
FIELD CULTIVATORS	Life = 15		Annual Hours Use = 250		Annual Repair Rate = 6%	Replace Cost						
16' Wing	60	9000	10.82	4.34	6.22	2.16	23.55	8.5	2.77			
22' Wing	80	13500	18.04	6.32	9.34	3.24	36.94	12.0	3.08			
32' Wing	120	15000	27.96	10.12	10.37	3.60	52.06	17.0	3.06			
42' Wing	160	21000	35.62	13.35	14.52	5.04	68.54	22.0	3.12			
DISCS - TANDEM HD	Life = 15		Annual Hours Use = 150		Annual Repair Rate = 6%	Replace Cost						
16' Single	100	14000	25.25	8.50	16.14	5.60	55.49	7.5	7.40			5.00 - 10.00 per acre
24' Wing	140	25500	31.56	11.51	29.40	10.20	82.66	12.0	6.89			
30' Wing	220	28500	45.54	15.40	32.85	11.40	105.19	16.5	6.38			
16' Heavy Offset	140	21000	31.56	11.51	24.21	8.40	75.68	7.5	10.09			
ROTOVATORS	Life = 15		Annual Hours Use = 100		Annual Repair Rate = 6%	Replace Cost						
5' Rotor	80	12000	18.04	6.32	20.75	7.20	52.31	1.2	43.59			
6' Rotor	100	15000	25.25	8.50	25.94	9.00	68.69	1.4	49.06			
8' Rotor	120	19000	27.96	10.12	32.85	11.40	82.33	1.7	48.43			
V-BLADE	Life = 15		Annual Hours Use = 150		Annual Repair Rate = 6%	Replace Cost						
21'	100	16000	25.25	8.50	18.44	6.40	58.60	11.0	5.33			
28'	160	21000	35.62	13.35	24.21	8.40	81.58	15.0	5.44			
42'	250	29000	48.70	17.88	33.43	11.60	111.60	20.0	5.58			

400 Annual Hours of Tractor Use figues are used to determine above Power Unit Costs

CULTIVATING, SEEDING & SPRAYING EQUIPMENT

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	TOTAL Machine Cost Acre/Hr	TOTAL Machine Cost $/Acre	Labor $/	Profit $/	Market Rate Survey 1989
ROD WEEDER/MULTIPLEX Life = 15		Annual Hours Use = 150			Annual Repair Rate = 6% Replace Cost							
24'	100	11000	25.25	8.50	12.68	4.40	50.83	12.0	4.24			
36'	120	15000	27.96	10.12	17.29	6.00	61.37	16.0	3.84			
48'	160	21000	35.62	13.35	24.21	8.40	81.58	25.0	3.26			
HARROWS	Life = 15		Annual Hours Use = 40		Annual Repair Rate = 2% Replace Cost							
Spring Tooth 50'	80	8000	18.04	6.32	34.58	4.00	62.94	35.0	1.80			1.50 - 2.75 per acre
Spring Tooth 70'	120	11000	27.96	10.12	47.55	5.50	91.13	48.0	1.90			
Harrow Packers 40'	140	18000	31.56	11.51	77.81	9.00	129.88	25.0	5.20			
Harrow Packers 70'	180	24000	39.68	14.22	103.75	12.00	169.65	44.0	3.86			
SEED DRILLS	Life = 15		Annual Hours Use = 100		Annual Repair Rate = 2% Replace Cost							
Press Drills 12'	60	17000	10.82	4.34	29.40	3.40	47.96	6.5	7.38			5.00 - 7.00 per acre
End Wheel 12'	60	10000	10.82	4.34	17.29	2.00	34.45	6.5	5.30			
Hoe Drill 12'	60	18000	10.82	4.34	31.12	3.60	49.89	6.5	7.67			
Zero/Min. Till 12'	60	23000	10.82	4.34	39.77	4.60	59.53	4.5	13.23			
AIR SEEDER W/CULT.	Life = 15		Annual Hours Use = 150		Annual Repair Rate = 3% Replace Cost							
28'	140	39000	31.56	11.51	44.96	7.80	95.83	16.5	5.81			
42'	250	58000	48.70	17.88	66.86	11.60	145.03	25.0	5.80			
45' WITH PACK WHEELS	250	75000	48.70	17.88	86.46	15.00	168.03	27.0	6.22			
SPRAYER (TRAILER)	Life = 15		Annual Hours Use = 50		Annual Repair Rate = 3% Replace Cost							
400 Gallon 68'	60	10000	10.82	4.34	34.58	6.00	55.75	35.0	1.59			2.50 - 3.50 per acre
800 Gallon 80'	60	12000	10.82	4.34	41.50	7.20	63.86	47.0	1.36			
SPRAYER (SP)	Life = 10		Annual Hours Use = 100		Annual Repair Rate = 3% Replace Cost							
130 Gallon 54'	60	22000	43.73	6.60			50.33	40.0	1.26			
1000 Gal 54' Float	160	120000	238.51	36.00			274.51	85.0	3.23			
320 Gallon 45' + 3/4 Ton 4x4	60	28000	55.65	8.40			64.05	35.0	1.83			

400 Annual Hours of Tractor Use figues are used to determine above Power Unit Costs

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	TOTAL Machine Cost Acre/Hr	TOTAL Machine Cost $/Acre	Labor $/	Profit $/	Market Rate Survey 1989
SWATHER (SP)	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 3%	Replace Cost					
16' Forage & Grain + Conditioner	60	40000	69.16	14.54			83.71	7.0	11.96			
20' Grain	60	37000	63.98	13.64			77.62	10.0	7.76			
SWATHER (PULL-TYPE)	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 3%	Replace Cost					
15' Grain	40	6500	9.02	3.06	11.24	1.95	25.27	7.5	3.37			
18' Grain	60	10000	10.82	4.34	17.29	3.00	35.45	10.0	3.55			
24' Grain	60	12000	10.82	4.34	20.75	3.60	39.51	12.0	3.29			5.00-6.00 per acre
MOWER	Life = 15		Annual Hours Use = 50			Annual Repair Rate = 2%	Replace Cost					
7'	40	5500	9.02	3.06	19.02	2.20	33.30	3.0	11.10			
MOWER CONDITIONER	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 3%	Replace Cost					
14' SP Diesel	70	47000	81.27	17.30			98.56	7.0	14.08			
9' PTO	60	14000	10.82	4.34	24.21	4.20	43.57	5.0	8.71			6.00 - 11.00 per acre
14' PTO	80	22000	18.04	6.32	38.04	6.60	69.00	6.5	10.62			
RAKE	Life = 15		Annual Hours Use = 50			Annual Repair Rate = 2%	Replace Cost					
9' Parallel Bar	40	5000	9.02	3.06	17.29	2.00	31.37	5.0	6.27			
FORAGE HARVESTER	Life = 12		Annual Hours Use = 100			Annual Repair Rate = 3%	Replace Cost					
20"	120	20000	27.96	10.12	37.06	6.00	81.14					3.35 - 6.00 per tonne
26"	180	28000	39.68	14.22	51.88	8.40	114.18					120 - 130 per hour
DUMP WAGON	Life = 15		Annual Hours Use = 100			Annual Repair Rate = 2%	Replace Cost					
Small (700 cu ft)	0	11500	19.88	2.30			22.18					
Medium (900 cu ft)	0	15000	25.94	3.00			28.94					
Large (1200 cu ft)	0	21000	36.31	4.20			40.51					

400 Annual Hours of Tractor Use figues are used to determine above Power Unit Costs

BALING EQUIPMENT

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	TOTAL Machine Cost Bales/Hr	TOTAL Machine Cost $/Bale	Twine Cost $/Bale	Total Cost $/Bale	Labor $/	Profit $/	Market Rate Survey 1989
BALERS (STANDARD)	Life = 10		Annual Hours Use = 80			Annual Repair Rate = 3%	Replace Cost							
Small 14" x 18"	40	12000	9.02	3.06	29.81	4.50	46.40	200	0.23	0.08	0.31			0.25 - 0.40 per bale
Large 16" x 18"	60	18000	10.82	4.34	44.72	6.75	66.63	300	0.22	0.08	0.30			
LARGE ROUND	Life = 12		Annual Hours Use = 60			Annual Repair Rate = 2%	Replace Cost							
800 Lb. Bale	60	18000	10.82	4.34	55.59	6.00	76.75	18	4.26	0.40	4.66			5.00 - 6.50 per bale
1500 Lb. Bale	60	24000	10.82	4.34	74.11	8.00	97.28	16	6.08	0.40	6.48			
BIG SQUARE	Life = 10		Annual Hours Use = 150			Annual Repair Rate = 3%	Replace Cost							
1500-2000 Lb. Bale	160	79000	35.62	13.35	104.68	15.80	169.45							10.00 per bale
BALE WAGONS	Life = 12		Annual Hours Use = 80			Annual Repair Rate = 3%	Replace Cost							
SP 160 Bale	40	80000	185.29	30.00			215.29	400	0.54	0.00	0.54			0.20 - 0.30 per bale
PULL 142 Bale	80	28000	18.04	6.32	64.85	10.50	99.71	300	0.33	0.00	0.33			
PULL 104 Bale	60	25000	10.82	4.34	57.90	9.38	82.44	240	0.34	0.00	0.34			
PULL 55 Bale	40	15000	9.02	3.06	34.74	5.63	52.45	160	0.33	0.00	0.33			
STACKERS	Life = 12		Annual Hours Use = 80			Annual Repair Rate = 3%	Replace Cost							
4 ton Rectangular	80	20000	18.04	6.32	46.32	7.50	78.18							
8 ton Rectangular	120	28000	27.96	10.12	64.85	10.50	113.43							

400 Annual Hours of Tractor Use figues are used to determine above Power Unit Costs

Years Life = 13
Annual Use = 100, 150*, 200
Annual Repair Rate = 3% of Replacement Cost

COMBINES

Combine Cylinder Width	Annual Hours Use	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	TOTAL Machine Cost Acre/Hr	TOTAL Machine Cost $/Acre	Labor $/	Profit $/	Market Rate Survey 1989
POWER TAKE OFF 44-50 IN CYLINDER (Tractor HP = 120)	100	45000	27.96	10.12	81.16	9.00	128.24	6.0	21.37			12.00 - 14.00 per acre 17.00 - 23.00 per irrigated acre
	150				54.11		101.19		16.86			
	200				40.58		87.66		14.61			
LARGE PTO (Tractor HP = 180)	100	72000	39.68	14.22	129.86	14.40	198.17	8.5	23.31			
	150				86.57		154.88		18.22			
	200				64.93		133.24		15.67			
SP DIESEL 45 INCH (HP = 100)	100	80000	144.29	20.30			164.59	5.5	29.93			
	150		96.19				116.50		21.18			
	200		72.15				92.45		16.81			
SP DIESEL 50 INCH (HP = 120)	100	95000	171.35	24.47			195.82	6.5	30.13			
	150		114.23				138.70		21.34			
	200		85.67				110.15		16.95			
SP DIESEL 60 INCH (HP = 140)	100	125000	225.46	31.26			256.71	8.5	30.20			
	150		150.30				181.56		21.36			
	200		112.73				143.98		16.94			
ROTARY TYPE (SMALL)	100	95000	171.35	25.26			196.60	7.0	28.09			
	150		114.23				139.49		19.93			
	200		85.67				110.93		15.85			
ROTARY TYPE (MEDIUM) (HP = 175)	100	120000	216.44	30.65			247.08	8.5	29.07			
	150		144.29				174.94		20.58			
	200		108.22				138.87		16.34			
ROTARY TYPE (LARGE) (HP = 185)	100	140000	252.51	35.62			288.13	9.5	30.33			
	150		168.34				203.96		21.47			
	200		126.26				161.88		17.04			
ROTARY TYPE (LARGEST) (HP = 250)	100	155000	279.56	40.78			320.34	10.5	30.51			
	150		186.38				227.15		21.63			
	200		139.78				180.56		17.20			

* This Annual Hours Use figure is typical.

400 Annual Hours of Tractor Use figues are used to determine above Power Unit Costs

GRINDERS, MIXERS & DRYERS

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Tonne/Hr	$/Tonne	Labor $/	Profit $/	Market Rate Survey 1989
TUB GRINDER	Life = 12		Annual Hours Use = 80		Annual Repair Rate = 3%		Replace Cost					
15 Tons/Hour	80	18000	18.04	6.32	41.69	6.75	72.80	15.0	4.85			
25 Tons/Hour	140	25000	31.56	11.51	57.90	9.38	110.35	25.0	4.41			
PORTABLE GRINDER/MIX	Life = 10		Annual Hours Use = 80		Annual Repair Rate = 3%		Replace Cost					
20" Screen	80	12000	18.04	6.32	29.81	4.50	58.67					
24" Screen & Bale Shredder	100	17000	25.25	8.50	42.24	6.38	82.36					

GRAIN DRYERS	Life = 12	Annual Hours Use = 200			Annual Repair Rate = 3%			Moisture Drop 20-14% $/Tonne	Moisture Drop 17.5-14% $/Tonne
RECIRCULATING BATCH									
Small Propane = 37 L/Hr	40	15000	9.02	3.06	13.90	8.91	34.89	26.84 (1.3T/Hr)	17.44 (2.0T/Hr)
Medium Propane = 46 L/Hr	40	20000	9.02	3.06	18.53	11.28	41.89	24.64 (1.7T/Hr)	16.11 (2.6T/Hr)
Large Propane = 90 L/Hr	40	38000	9.02	3.06	35.20	21.90	69.19	17.30 (4.0T/Hr)	11.53 (6.0T/Hr)
CONTINUOUS FLOW									
Small Propane = 90 L/Hr	40	26000	9.02	3.06	24.09	20.10	56.27	17.05 (3.3T/Hr)	10.82 (5.2T/Hr)
Medium Propane = 110 L/Hr	40	37000	9.02	3.06	34.28	25.35	71.71	16.30 (4.4T/Hr)	10.24 (7.0T/Hr)
Large Propane = 145 L/Hr	40	55000	9.02	3.06	50.95	34.35	97.39	14.98 (6.5T/Hr)	9.94 (9.8T/Hr)

400 Annual Hours of Tractor Use figues are used to determine above Power Unit Costs

Years Life = 13
Annual Use = 150, 300*, 450
Annual Repair Rate = 3% of Replacement Cost

FARM TRUCKS

Truck Size	Annual Hours Used	Fuel Use litres/Hr $	Current Replace Cost $/Hr	Fixed Cost $/Hr	Variable Cost $/Hr	TOTAL Truck Cost $/Hr	Labor $/	Profit $/	Market Rate Survey 1989
GENERAL TRUCKING									
	150			27.67		40.07			
2 Ton	300	30	24000	13.83	12.41	26.24			
	450			9.22		21.63			
	150			33.43		48.67			
3 Ton	300	37	29000	16.71	15.24	31.95			
	450			11.14		26.38			
	150			42.65		61.36			
4 Ton	300	45	37000	21.33	18.71	40.03			
	450			14.22	-	32.92			
	150			55.33		77.47			
5 Ton	300	52	48000	27.67	22.14	49.81			
Tandem	450			18.44		40.59			

* This Annual Hours Use figure is typical.

ROCK PICKERS & VACUVATORS

Implement	Tractor HP	Current Replace Cost $	POWER UNIT OR SP UNIT Fixed Cost $/Hr	POWER UNIT OR SP UNIT Variable Cost $/Hr	IMPLEMENT Fixed Cost $/Hr	IMPLEMENT Variable Cost $/Hr	TOTAL Machine Cost $/Hr	Acre/Hr	$/Acre	Labor $/	Profit $/	Market Rate Survey 1989
ROCK PICKER	Life = 10		Annual Hours Use = 150			Annual Repair Rate = 6%	Replace Cost					
REEL TYPE	60	8500	10.82	4.34	11.26	3.40	**29.83**					
ROCK RAKE	60	6500	10.82	4.34	8.61	2.60	**26.38**					
RAKE - PICKER COMBO	80	14000	18.04	6.32	18.55	5.60	**48.51**					
VACUVATORS	Life = 15		Annual Hours Use = 150			Annual Repair Rate = 3%	Replace Cost					
SMALL	80	10000	18.04	6.32	11.53	2.00	**37.89**	700.0	**0.05**			
LARGE	100	16000	25.25	8.50	18.44	3.20	**55.40**	180.0	**0.31**			

400 Annual Hours of Tractor Use figues are used to determine above Power Unit

MACHINERY COST

Section 1: On the top of the sheet (page 15), record all the information needed to calculate ownership and operating costs.

TERM	LINE	INFORMATION REQUIRED
Machine description		the machine and model
Today's new price	A	the suggested retail price of the desired machine (new or used)
Planning period	B	the number of years the machine will be owned
Today's used price	C	the price of a used machine that is similar to the new desired machine and as old as the planning period
Prime interest rate	D	the Bank of Canada prime rate of interest
Risk premium	E	a value estimate which represents the additional risk of the project over and above the basic prime rate of interest
Marginal tax rate	F	the expected marginal tax rate of the farm business during the planning period
Rate of inflation	G	the current rate of inflation e.g. the consumer price index
Discount factor	H	value used to arrive at the present value (dollar amount) of the future salvage value of the new machine - calculated on the reverse of the worksheet
Capital cost allowance class percentage	I	the appropriate percentage rate for the machine (tax purpose depreciation)
Capital cost allowance adjustment factor	J	value used to arrive at the after tax capital outlay as well as the after tax salvage value
Capital recovery factor	K	value that recovers that capital value of the machine through time with the specified real return - calculated on the reverse side of the worksheet

Section 2: Calculates ownership on a yearly and hourly basis

Capital recovery	1	calculates the capital value decline with a real return on investment
Insurance and housing	2	Line A x 1%
Total ownership costs per year	3	Line 1 + Line 2
Total ownership costs per hour	4	Line 3 divided by annual hours of use

Section 3: Calculates operating costs on an hourly and yearly basis

Fuel cost	5	the expected fuel consumption x the price of fuel X (1 - marginal tax rate)
Lubrication	6	Line 5 x 15% X (1 - marginal tax rate)
Repair costs	7	the average repair cost per year divided by annual hours of use X (1 - marginal tax rate)
Total operating costs per hour	8	Line 5 + Line 6 + Line 7
Total operating costs per year	9	Line 8 multiplied by annual hours of use

Section 4: Calculates total operating costs for the hour and year

Total cost per year	10	Line 3 + Line 9
Total cost per hour	11	Line 4 + Line 8

MACHINERY COST WORKSHEET

Machine description:_____

Todays new Price $_____ (A)
Used price $_____ (C)
Risk premium_____%(E)
Rate of inflation_____%(G)
CCA class rate_____%(I)
Capital recovery factor (from reverse)_____

Planning period_____Years(B)
Prime interest rate_____%(D)
Marginal tax rate_____%(F)
Real discount factor (from reverse)_____ (H)
CCA adjust factor (from reverse)_____ (J)
(K)

OWNERSHIP COSTS (Calculated on yearly basis)	YEARLY COST	HOURLY COST
1. Capital recovery = [(Line A x Line J) - (Line C x Line J x Line H)] x Line K = $(_____ x _____) - (_____ x _____ x _____) x _____ =	$_____	
2. Insurance and housing = today's new price x 1% = $_____ x _____% =	$_____	
3. Total ownership costs per year	$_____	
4. Total ownership costs per hour = total costs per year ÷ hours of annual use = $_____ ÷ _____hours =		$_____
OPERATING COSTS (Calculated on hourly basis)		
5. Fuel cost = litres/hr (gal/hr) x price per litre (price per gallon) x (1 - Line F) = _____ x $_____ x _____ =		$_____
6. Lubrication = fuel cost x 15% x (1 - Line F) = $_____ x _____% x _____ =		$_____
7. Repairs = average annual repair cost ÷ hours of annual use x (1 - Line F) = $_____ ÷ _____hours x _____ =		$_____
8. Total operating costs per hour		$_____
9. Total operating costs per year = total operating costs/hour x hours of annual use = $_____ X _____hours =	$_____	
10. Total costs per year (line 3 + line 9) = $_____ + $_____ =	$_____	
11. Total costs per hour (line 4 + line 8) = $_____ + $_____ =		$_____

REAL DISCOUNT RATE

$$= \frac{(1 + \text{Line D} + \text{Line E})}{1 + \text{Line G}} - 1 \qquad (1 - \text{Line F})$$

$$= \frac{(1 + \quad + \quad)}{1 + \quad} - 1 \qquad (1 - \quad)$$

= _____ (M)

REAL DISCOUNT FACTOR

$$= 1 + (1 + \text{Line M})^{\text{Line B}}$$

$$= 1 + (1 + \quad)^{-\quad}$$

= _____ (transfer to Line H)

CCA ADJUST FACTOR

$$= 1 - \frac{\text{Line I} \times \text{Line F}}{\text{Line I} + \text{Line H}}$$

$$= 1 - \frac{X}{\quad + \quad}$$

= _____ (transfer to Line J)

CAPITAL RECOVERY FACTOR

$$= \frac{\text{Line M}}{1 - \text{Line H}}$$

$$= \frac{\quad}{1 - \quad}$$

= _____ (transfer to line K)

MACHINERY COST WORKSHEET

Machine description:
40 HP Tractor
400 hours per year
8 litres per hour @ 15¢/litre
average $/yr repair cost 3% of New Price

Todays new Price $20,000 (A)
used price $2,000 (C)
Risk premium 6 %(E)
Rate of inflation 4 %(G)
CCA class rate 30 %(I)
Capital recovery factor (from reverse) .152 (K)

Planning period 13 Years(B)
Prime interest rate 10 %(D)
Marginal tax rate 0 %(F)
Real discount factor (from reverse) .243 (H)
CCA adjust factor (from reverse) 1 (J)

OWNERSHIP COSTS (Calculated on yearly basis)	YEARLY COST	HOURLY COST
1. Capital recovery = [(Line A x Line J) - (Line C x Line J x Line H)] x Line K = $(20,000 x 1) - (2,000 x 1 x .243) x .152 =	$2,966	
2. Insurance and housing = today's new price x 1% = $20,000 x 1% =	$ 200	
3. Total ownership costs per year	$3,166	
4. Total ownership costs per hour = total costs per year ÷ hours of annual use = $3,166 ÷ 400 hours =		$ 7.92
OPERATING COSTS (Calculated on hourly basis)		
5. Fuel cost = litres/hr (gal/hr) x price per litre (price per gallon) x (1 - Line F) = 8 x $.15 x 1 =		$ 1.20
6. Lubrication = fuel cost x 15% x (1 - Line F) = $1.20 x 15% x 1 =		$ .18
7. Repairs = average annual repair cost ÷ hours of annual use x (1 - Line F) = $600 ÷ 400 hours x 1 =		$ 1.50
8. Total operating costs per hour		$ 2.88
9. Total operating costs per year = total operating costs/hour x hours of annual use = $2.88 x 400 hours =	$1,152	
10. Total costs per year (line 3 + line 9) = $3,166 + $1,152 =	$4,318	
11. Total costs per hour (line 4 + line 8) = $7.92 + $2.88 =		$ 10.80

REAL DISCOUNT RATE

$$= \frac{(1 + \text{Line D} + \text{Line E})}{1 + \text{Line G}} - 1 \qquad (1 - \text{Line F})$$

$$= \frac{(1 + .10 \quad + .06 \quad)}{1 + .04} - 1 \qquad (1 - 0 \quad)$$

= .115 (M)

REAL DISCOUNT FACTOR

$$= 1 + (1 + \text{Line M})^{\text{Line B}}$$

$$= 1 + (1 + .115)^{13}$$

= .243 (transfer to Line H)

CCA ADJUST FACTOR

$$= 1 - \frac{\text{Line I X Line F}}{\text{Line I + Line M}}$$

$$= 1 - \frac{.3 \quad X \quad 0}{.3 \quad + .115}$$

= 1 (transfer to Line J)

CAPITAL RECOVERY FACTOR

$$= \frac{\text{Line M}}{1 - \text{Line H}}$$

$$= \frac{.115}{1 - .243}$$

= .152 (transfer to Line

FUEL CONSUMPTION FOR VARYING TRACTOR HORSEPOWER[1]

TRACTOR TYPE AND SIZE	AVERAGE DRAWBAR HORSEPOWER[2]		AV. FUEL CONSUMPTION[3] (Litres per Hour)	
	Diesel Tractors	Gasoline Tractors	Diesel Tractors	Gasoline Tractors
Two Wheel Drive PTO HP				
30 - 39	....	31.5	....	10.5
40 - 49	....	38.3	....	12.3
50 - 59	48.2	47.1	10.5	15.0
60 - 69	56.2	55.2	13.6	20.0
70 - 79	65.5	64.5	16.4	23.2
89 - 89	73.5	74.5	17.7	26.8
90 - 99	84.0	82.0	20.5	28.2
100 - 119	90.3	....	22.7	....
120 - 139	111.6	....	28.2	....
140 - 159	128.9	....	32.3	....
160 - 179	145.8	....	38.6	....
Over 180	148.9	....	39.1	....
Four Wheel Drive DBHP				
100 - 149	135.0	....	33.2	....
150 - 174	159.4	....	40.3	....
175 - 199	182.8	....	50.0	....
200 - 224	217.4	....	53.0	....
225 - 249	235.5	....	58.0	....
250 - 274	265.0	....	61.4	....
275 - 299	281.3	....	62.6	....
300 - 349 *	305.0	....	66.4	....
Over 350 *	385.0	....	92.4	....

* Includes only one tractor

NOTES ON FUEL CONSUMPTION TABLE

This data on fuel consumption for different sizes of tractors was calculated from the Nebraska Tractor Tests Reports. The fuel consumption figures are based on "75% of Pull at Maximum Power". These fuel consumption figures are for tractors under normal load in average field conditions. Fuel use per hour will be affected by:-

- load factor (75% is assumed in these estimates
- engine RPM
- gear
- correct engine tuning

While these figures may be a good indication of fuel use per hour for a machine, fuel consumption per acre will be affected by the Field Efficiency related to each operation. Estimation of total fuel consumption should take this factor into account. Some factors that can significantly affect field efficiency include:-

- wheel slippage
- tire pressure
- tractor ballast
- depth of and sharpness of implement
- soil type and condition
- amount of turning required
- implement overlap in each pass
- down time to refill seed and fertilizer boxes

1 This data was summarized from "Nebraska Tractor Test Summary 1972 through 1981", The Grain Grover, Page 762 (UGG), April, 1982 and from 1980 - 1981, Agricultural Yearbook, A.S.A.E, May, 1980, pp 537-545.
2 Average Drawbar Horsepower for all tractors in each range.
3 Average fuel consumption for all tractors in each range.

MACHINERY COSTS ASSUMPTION GUIDE

MACHINE	A Depreciation Lifetime (Years)	B Annual Use (Hours)	C Annual Repair rate % orig.Cost	D Lifetime Repairs % orig.Cost	E Field Efficiency
Tractors	13	600	3%	120%	.....
Combines	12	150	3%	60%	60 - 80%
Cultivators	15	250	3-8%	120%	70 - 90%
Discers	15	150	3%	120%	70 - 90%
Rodweeders	15	100	2%	100%	70 - 90%
Seed Drills	15	100	2%	100%	65 - 80%
Harrows, Packers	15	40	2%	120%	70 - 90%
Sprayers	15	50	2%	80%	50 - 80%
Stone Pickers	15	40	2%	100%	50 - 80%
Swathers	15	100	3%	95%	70 - 85%
Mowers & Rakes	15	50	2%	100%	60 - 90%
Mower-Condtioner	15	50	2%	100%	60 - 85%
Forage Harvester	15	80	3%	80%	50 - 80%
Balers					
Standard	10	80	3%	80%	60 - 85%
Large Round	12	60	2%	60	60 - 85%
Grain Dryers	12	200	3%	...	.....
Loaders	15	40	2%	90%	.....

NOTES ON COLUMN HEADINGS

A. Estimated average number of years until a machine depreciates to 10% of original cash cost.

B. Estimated average annual farm use.

C. Estimates are based on average conditions and the indicated annual hours of use.

D. Total repairs as a percent of the original cash cost. Repairs are usually low in the first years before they begin to increase at an increasing rate as the machine wears out. These figures could be viewed as a maximum since they reflect high rates in later years.

E. Field Efficiency is a percentage estimate of the amount of time machinery is actually in use relative to the total time required to complete an operation (refer also opposite page).

ACRES PER HOUR

Acres per hour (or "Effective Field Capacity") can be calculated using the following formula:-

$$\text{Acres per hour (Effective field Capacity)} = \frac{\text{machine width (ft)} \times \text{speed (mph)} \times \text{field efficiency}}{8.25}$$

E.G. A 31' cultivator travelling at 5 m.p.h. operating at 80% field efficiency would have an effective field capacity of:-

$$\text{Acres per hour} = \frac{31 \times 5 \times .80}{8.25} = 15 \text{ ac/hr}$$